MAURI ORA, 1973, 1: 91-94

ACTIVITY AND DAILY BREATHING PATTERNS OF THE GECKO, *HOPLODACTYLUS PACIFICUS* GRAY

I. McIVOR,

Department of Zoology, University of Canterbury,
Christchurch, New Zealand.

ABSTRACT

Actograph studies were used to demonstrate the daily pattern of activity of *Hoplodactylus pacificus*, the common New Zealand gecko. An endogenous activity pattern is shown to be synchronised with sunset, with maximum activity occurring in the four hours following sunset. This nocturnal activity is restricted by temperature; activity decreasing with falling temperature to an imperceptible level below 10°C.

A peak in breath rate coincides with the onset of the activity period, suggesting an endogenous correlation of breath rate with activity pattern.

INTRODUCTION

Hoplodactylus pacificus, the common New Zealand gecko, is known to be nocturnally active (Sharell 1966, Whitaker 1968). This paper reports the existence of a definite daily activity pattern also, and correlates it with a daily breathing pattern.

METHODS

MEASUREMENT OF ACTIVITY

An actograph, built after the model described by Bustard and Grant (1969), was used for measuring activity. A Honeywell continuous recorder recorded activity, light and temperature. The sensitive actograph was double mounted to record movements of geckos in any direction.

Adult geckos (5.5 - 6.5 g) were used for all experiments. Experimental animals were run singly and given 24 hr to become accustomed to the actograph before records were taken. Water, but no food, was provided during recording. A maximum of seven 24 hr records were taken for any one gecko.
Activity was measured at:

(i) 21°C in a constant temperature room under natural light fluctuations.

(ii) 11 - 16°C, outdoors, the actograph covered by a miniature glass house to prevent movement from wind. The risk of death through overheating restricted outdoor recordings to between 5pm and 8am.

(iii) 7, 9.5, 14°C in a constant temperature room in darkness.

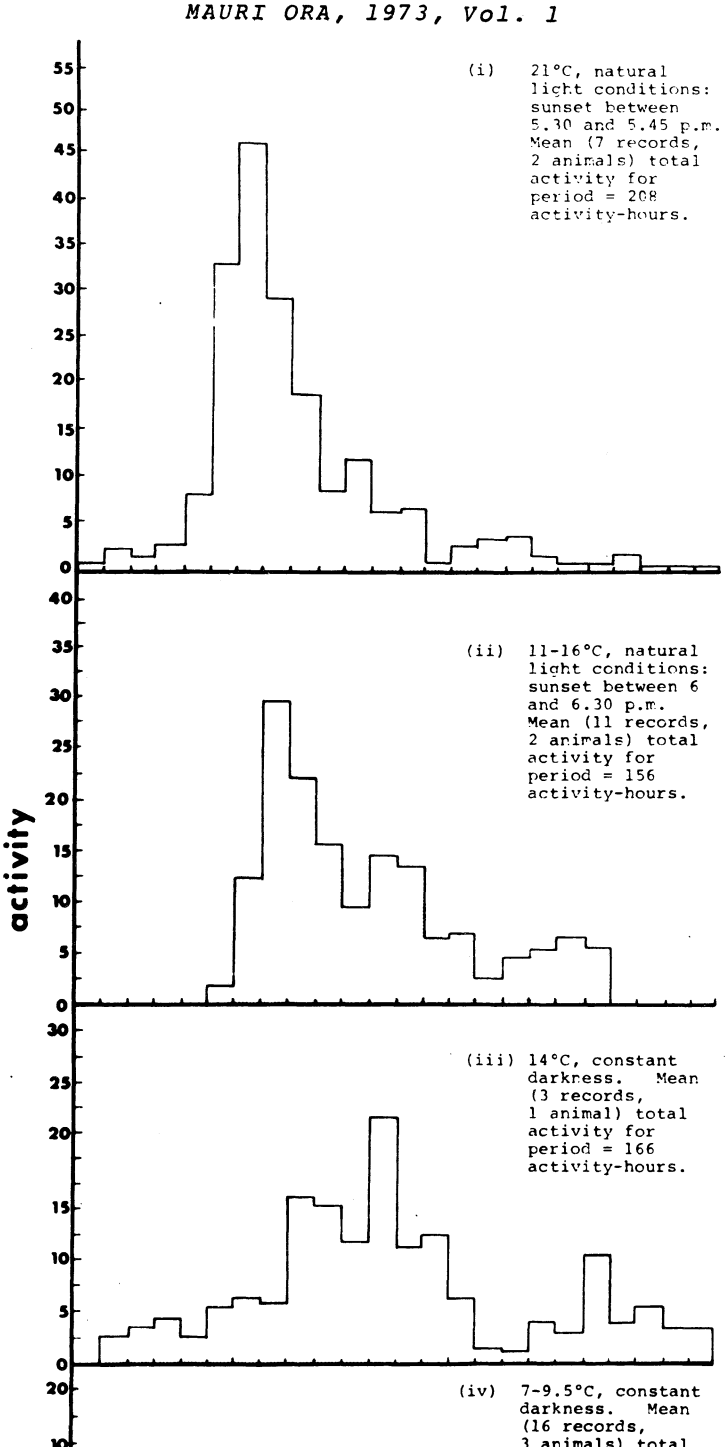

Fig. 1. Activity of H. pacificus recorded in an actograph under different temperature and light conditions.

MEASUREMENT OF BREATHING PATTERN

Three adult geckos were strapped onto a pinex board and allowed 2 hr to settle down. Breathing rates were then measured for 5 min every hour for 24 hr and recorded as mean breath rate per min.

RESULTS

ACTIVITY PATTERN

The actograph data are based on 37 separate records from 5 geckos (Fig. 1). Activity can be compared at different temperatures, and under natural light conditions and darkness at 11 - 16°C and 14°C respectively. Using an arbitrary scale of activity units, an average measure of total activity-hours (the area under the activity-time curves in Fig. 1) can be given for an individual gecko over the recording period.

Activity was greatest at night, with onset of activity closely coinciding with sunset activity reached a peak 1 - 2 hr after sunset with most activity occurring within 4 hr after sunset, and a falling off to a low level by 1 - 2am. Although activity in constant darkness was greatest over the same period as under natural light conditions, the onset was more gradual and the peak less marked in constant darkness (Fig. 1 ii, iii). Total activity-hours were similar for constant darkness and natural light conditions at 14 and 11 - 16°C.

Activity decreased with temperature decrease until, at 7 - 9.5°C, activity was almost nil and the characteristic nocturnal activity pattern evident at higher temperatures was absent.

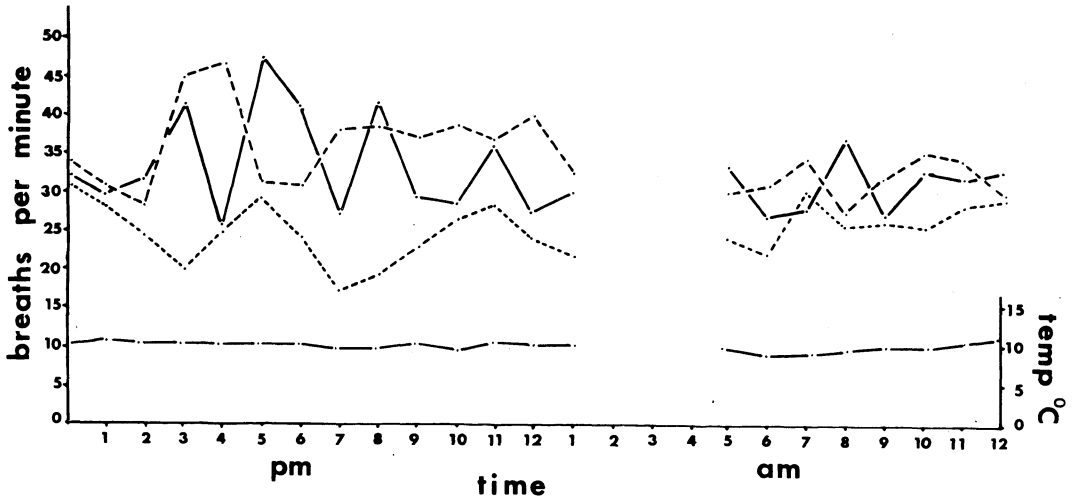

Fig. 2. Breathing pattern of H. pacificus over 24 h for 3 subjects at ca 10°C ambient temperature.

DAILY BREATHING PATTERN

Breathing rates for three subjects were simultaneously recorded, together with ambient temperature which was ca 10°C

(Fig. 2). A peak in breathing rate for two of the three geckos coincided with sunset at 5.30pm.

DISCUSSION

Hoplodactylus pacificus showed a consistent well-defined activity pattern under natural light conditions which is similar to that reported for *Gehyra variegata, Diplodactylus vittatus, Hemidactylus frenatus* (Bustard 1967, 1968, 1970), *Thecadactylus rapicaudus* (Park 1938) and *Coleonyx variegatus* (Evans 1966).

In *H. pacificus*, onset of the main activity period coincided with failing light at sunset, and the importance of this factor in initiating activity is seen where compared with the records of activity in constant darkness. It is concluded that the nocturnal activity pattern of *H. pacificus* is endogenous, but its onset is synchronised with light changes at sunset. Neither the period nor the peak of activity was affected by decreasing temperature (cf. Bustard 1967, 1968), although the amount of activity decreased with decreasing temperature until it practically ceased at below 10°C.

H. pacificus showed a peak in breathing rate about sunset, even when normal activity was prevented. It seems likely that an endogenous buildup in respiration rate occurs in preparation for the activity period, further indicating the existence of an endogenous activity pattern. This respiratory buildup possibly provides an oxygen store in the tissues for utilisation during the activity period.

ACKNOWLEDGMENTS

My thanks go to Mr A.H. Whitaker (Ecology Division, New Zealand Department of Scientific and Industrial Research) who suggested the major part of this programme, and to Dr M.C. Crawley for his helpful criticism of this manuscript.

LITERATURE CITED

BUSTARD, H.R. 1967. Activity cycle and thermoregulation in the Australian gecko, Gehyra variegata. Copeia 1967: 753-758.

———— 1968. Temperature dependent activity in the Australian gecko, Diplodactylus vittatus. Copeia 1968: 606-612.

———— 1970. Activity cycle of the tropical house gecko, Hemidactylus frenatus. Copeia 1970: 173-176.

———— and GRANT, I. 1969. Recording activity of small reptiles and amphibians. Copeia 1969: 843-847.

EVANS, K.J. 1966. Responses of the locomotor activity rhythms of lizards to simultaneous light and temperature cycles. Journal of Comparative Biochemistry and Physiology 19: 91-103.

PARK, O. 1938. Studies in nocturnal ecology. 7. Preliminary observations on Panamanian rain forest animals. Ecology 19: 208-223.

SHARELL, R. 1966. The tuatara, lizards and frogs of New Zealand. Collins, London. 94 pp.

WHITAKER, A.H. 1968. The lizards of Poor Knight's Islands, New Zealand. New Zealand Journal of Science 11: 623-651.